U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

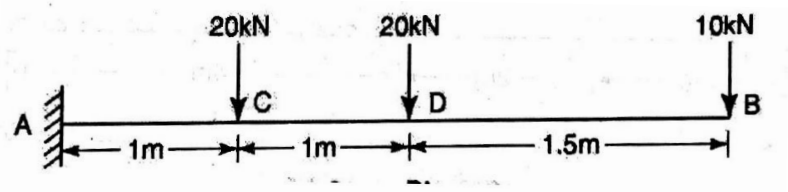
Autonomous Institute Affiliated to VTU

September / October 2023 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: Aerospace Engineering **Duration: 3 hrs.**
Course Code: 22AS4PCSDM **Max Marks: 100**
Course: Solid Mechanics

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	What is solid mechanics in aerospace engineering?	*CO* 1	*PO* 1	**04**
	b)	What is stress and strain? State Hooke's law? Explain the stress-strain diagram with a	*CO* 1	*PO* 1	**08**
	c)	With suitable sketch explain uniaxial, biaxial and tri-axial state of stress?	*CO* 1	*PO* 1	**08**
		OR			
2	a)	Derive the relation between E G and K.	*CO* 2	*PO 1*	**10**
	b)	Steel railroad rails 10 m long are laid with end-to-end clearance of 3 mm at a temperature of 15ºC.(a) At what temperature will the rails just come in contact?(b) What stress would be induced in the rails at that temperature if there were no initial clearance? Use α_s==11.7 ×10^6/ºC and E=200 GPa.	*CO* 2	*PO 2*	**10**
		UNIT - II			
3	a)	Derive the formula for the maximum bending moment for a cantilever beam with UDL?	*CO 1*	*PO 1*	**08**
	b)	Analyse and draw SFD and BMD for beam shown in Fig. 3b.  Fig.3b	*CO 2*	*PO 2*	**12**
		OR			
4	a)	Derive the expression for bending stresses for composite beam with suitable sketch?	*CO 1*	*PO 1*	**8**
	b)	A T-section of simply supported bean has the following dimensions. Width of the flange = 100 mm, overall depth = 100	*CO 2*	*PO 2*	**12**

			mm, and thickness of stem and flange = 20 mm a) Determine the maximum stress in the beam when a when a bending moment at 1200 N-m is acting on the section b) calculate the shear stress at the neutral axis and at the junction of web and the flange when a shear force of 50 kN acting on the beam c) Draw bending stress and shear stress diagram along the section.			
			UNIT - III			
	5	a)	What is Macaulay's method of beam?	*CO 1*	*PO 1*	**06**
		b)	What is Castigliano's first theorem and state their advantages?	*CO 1*	*PO 1*	**06**
		c)	A simple supported beam with a span of L = 10 m, a uniform load of w = 10,000 N/m, and the following material properties: Young's modulus, E = 200 GPa, the moment of inertia, I = 0.0015 m^4. Calculate the deflection in beam.	*CO 2*	*PO 2*	**08**
			UNIT - IV			
	6	a)	With suitable assumptions derive torsion equation?	*CO* 1	*PO* 1	**10**
		b)	A 2m long pin ended column of square C/S is made of wood. Assuming E=12GPa and allowable stress being limited to 12MPa, examine the size of the column to support the following loads safely 95kN 200kN Use FOS of 3 and Euler's crippling load for buckling	*CO* 2	*PO* 2	**10**
			UNIT - V			
	7	a)	Write note on principal stresses. Write the steps for determining them using the Mohr's circle diagram with neat sketch.	*CO* 1	*PO* 1	**10**
		b)	Find the diameter of a rod subjected to a bending moment of 3 kNm and a twisting moment of 1.8 kNm according to the following theories of failures, taking normal yield stress as 420 MPa and factor of safety as 3. (i) Normal stress theory, (ii) Shear Stress theory.	*CO* 2	*PO* 2	**10**

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